

Volume 575  
December 18, 1989

## THE PSYCHOBIOLOGY OF HUMAN EATING DISORDERS: PRECLINICAL AND CLINICAL PERSPECTIVES<sup>a</sup>

*Editors*

LINDA H. SCHNEIDER, STEVEN J. COOPER, and KATHERINE A. HALMI

*Scientific Advisory Committee*

BRIAN L. G. MORGAN, *Chair*, LEON BRADLOW, WILLIAM S. CAIN,  
KEVIN KEIM, and PHILIP SIEKEVITZ

---

### CONTENTS

---

Preface. <i>By LINDA H. SCHNEIDER, STEVEN J. COOPER, and KATHERINE A. HALMI</i> .....	xi
---	----

#### Part I. Disturbed Eating Behavior in Clinical Disorders KATHERINE A. HALMI, *Chair*

The Approaches to the Study of Human Disorders in Food Ingestion and Body Weight Maintenance. <i>By PAUL R. MCHUGH, TIMOTHY H. MORAN, and MARIE KILLILEA</i> .....	1
The Modern History of Anorexia Nervosa: An Interpretation of Why the Illness Has Changed. <i>By GERALD F. M. RUSSELL and JANET TREASURE</i> .....	13
Depression, Antidepressants, and Body Weight Change. <i>By MADELYN H. FERNSTROM</i> .....	31
Psychopharmacology of Eating Disorders. <i>By JAMES E. MITCHELL</i> .....	41
The Anorexia of the Elderly. <i>By JOHN E. MORLEY, ANDREW J. SILVER, DOUGLAS K. MILLER, and LAURENCE Z. RUBENSTEIN</i> .....	50
Summary: Part I. <i>By PAUL ROBINSON</i> .....	60

#### Part II. The Development and Application of Animal Models to Clinical Eating Disorders JOHN E. MORLEY, *Chair*

Animal Models of Human Eating Disorders. <i>By GERARD P. SMITH</i> .....	63
--	----

<sup>a</sup> This volume is the result of a conference entitled The Psychobiology of Human Eating Disorders, which was held in New York City on October 13-15, 1988. The conference was held by the New York Academy of Sciences.

Nutrient Imbalances in Depressive Disorders: Possible Brain Mechanisms. By R. J. WURTMAN, D. O'ROURKE, and J. J. WURTMAN.....	75
Metabolic Rate and Feeding Behavior. By STYLIANOS NICOLAIDIS and PATRICK EVEN .....	86
The Microstructure of Ingestive Behavior. By JOHN D. DAVIS.....	106
Mood- and Nutrient-Conditioned Appetites: Cultural and Physiological Bases for Eating Disorders. By D. A. BOOTH .....	122
The Economics of Hunger, Thirst, Satiety, and Regulation. By GEORGE COLLIER.....	136
Summary: Part II. By ARTHUR CAMPFIELD .....	155
General Discussion: Part II .....	157

**Part III. Neurochemistry and Pharmacology of  
Food Intake in Humans and Animals**  
ANTHONY SCLAFANI, *Chair*

Impact of Nutrition on the Pharmacology of Appetite: Some Conceptual Issues. By JOHN E. BLUNDELL .....	163
Microdialysis Studies of Brain Norepinephrine, Serotonin, and Dopamine Release During Ingestive Behavior: Theoretical and Clinical Implications. By B. G. HOEBEL, L. HERNANDEZ, D. H. SCHWARTZ, G. P. MARK, and G. A. HUNTER .....	171
Serotonin and the Pharmacology of Eating Disorders. By ROSARIO SAMANIN and SILVIO GARATTINI .....	194
Opioids: Are They Regulators of Feeding? By ALLEN S. LEVINE and CHARLES J. BILLINGTON .....	209
Hypothalamic Neuropeptide Y, Galanin, and Amines: Concepts of Coexistence in Relation to Feeding Behavior. By SARAH FRYER LEIBOWITZ .....	221
The Regulation of Food Intake by Peptides. By STEPHEN C. WOODS and JAMES GIBBS .....	236
Summary: Part III. By JAMES GIBBS .....	244

**Part IV: Neural and Behavioral Responses to Orosensory Stimuli**  
STYLIANOS NICOLAIDIS, *Chair*

Taste Responses from the Entire Gustatory Apparatus. By RALPH NORGREN, HISAO NISHIJO, and SUSAN P. TRAVERS .....	246
Oral Factors in Appetite and Satiety. By DOUGLAS G. MOOK.....	265
Dietary-Induced Overeating. By ANTHONY SCLAFANI.....	281
Stress-Reducing Effects of Ingesting Milk, Sugars, and Fats: A Develop- mental Perspective. By ELLIOTT M. BLASS, DAVID J. SHIDE, and ARON WELLER .....	292
Orosensory Self-Stimulation by Sucrose Involves Brain Dopaminergic Mechanisms. By LINDA H. SCHNEIDER .....	307
Benzodiazepine Receptor-Mediated Enhancement and Inhibition of Taste Reactivity, Food Choice, and Intake. By STEVEN J. COOPER .....	321
Summary: Part IV. By LINDA BARTOSHUK.....	338

**Part V. Sensory-Hedonic Aspects in Human Eating Behavior**  
**HARRY KISSILEFF, Chair**

Palatability of Food and the Ponderostat. <i>By MICHEL CABANAC</i> .....	340
The Functions of Taste and Olfaction. <i>By LINDA M. BARTOSHUK</i> .....	353
Quantifying Palatability in Humans. <i>By FRANCE BELLISLE</i> .....	363
Disorders of Food Selection: The Compromise of Pleasure. <i>By PAUL ROZIN</i> .....	376
Sensory-Specific Satiety in Anorexia and Bulimia Nervosa. <i>By MARION HETHERINGTON and BARBARA J. ROLLS</i> .....	387
Taste Responsiveness in Eating Disorders. <i>By ADAM DREWNOWSKI</i> .....	399
Is There an Eating Disorder in the Obese? <i>By HARRY R. KISSILEFF</i> .....	410
Summary: Part V. <i>By JOHN E. BLUNDELL</i> .....	420
General Discussion: Part V .....	424

**Part VI. Eating Behavior Studies in Anorexia Nervosa and Bulimia Nervosa**  
**G. F. M. RUSSELL, Chair**

Hunger and Satiety in Anorexia and Bulimia Nervosa. <i>By KATHERINE A. HALMI, SUZANNE SUNDAY, ANGELA PUGLISI, and PEGGY MARCHI</i> .....	431
Eating Behavior in Bulimia. <i>By B. TIMOTHY WALSH, HARRY R. KISSILEFF, and COLLEEN M. HADIGAN</i> .....	446
Gastric Function in Eating Disorders. <i>By P. H. ROBINSON</i> .....	456
Summary: Part VI. <i>By D. A. BOOTH</i> .....	466
Panel Discussion: Progress and Prospects for Research Related to Human Eating Disorders. <i>PAUL R. MCHUGH, Panel Moderator</i> .....	472

---

Long-Term Perspectives on the Study of Eating Behavior. <i>By ELIOT STELLAR</i> .....	478
---	-----

**Poster Papers**

Dietary Fat-Induced Overeating: Influence of Fat Composition. <i>By KAREN ACKROFF, FRANCOIS LUCAS, and ANTHONY SCLAFANI</i> .....	487
Glucoprivic Feeding and Activity-Based Anorexia in the Rat. <i>By PAUL F. ARAVICH, LEE E. DOERRIES, ERIC STANLEY, ARTHUR METCALF, and THOMAS J. LAUTERIO</i> .....	490
Serotoninergic Drug Potentiates the Satiating Capacity of Food: Action of <i>d</i> -Fenfluramine in Obese Subjects. <i>By JOHN E. BLUNDELL and ANDREW J. HILL</i> .....	493
Responses to the Visual Perception of Food in Eating Disorders. <i>By SABINE BOSSERT, CAROLINE MEILLER, REINHOLD LAESSLE, HEINER ELLGRING, and KARL-MARTIN PIRKE</i> .....	496
Dysregulation of 5-HT Function in Bulimia Nervosa. <i>By TIMOTHY BREWERTON, EDWARD MULLER, HARRY BRANDT, MICHAEL LESEM, ARLENE HEGG, DENNIS MURPHY, and DAVID JIMERSON</i> .....	500
Central Nervous System Opioid Mechanisms That Mediate Stimulation-Induced Feeding in the Rat. <i>By KENNETH D. CARR</i> .....	503

Evidence for a Tonic Inhibition of Food Consumption and Body Weight by the Striatum in Female Rats: Effects of Castration. <i>By A. WALLACE DECKEL</i> .....	506
Seasonal Variations in Bulimia Nervosa. <i>By VICTOR M. FORNARI, DAVID E. SANDBERG, JULIANA LACHENMEYER, DEBORAH COHEN, MICHAEL MATTHEWS, and GERARDO MONTERO</i> .....	509
The Stomach's Role in Appetite Regulation of Bulimia. <i>By ALLAN GELIEBTER, PAMELA M. MELTON, DONNA ROBERTS, RICHARD S. McCRAY, DENNIS GAGE, and SAMI A. HASHIM</i> .....	512
Cortisol Responses to Meals in Human Subjects Living without Time Cues. <i>By JUDITH GREEN and CHARLES P. POLLACK</i> .....	514
The Satiating Effect of Fats Is Attenuated by the Cholecystokinin Antagonist Lorglumide. <i>By DANIELLE GREENBERG, NORBERTO I. TORRES, GERARD P. SMITH, and JAMES GIBBS</i> .....	517
Effects of Parental Weight and Fatness on Relative Weight and Fatness of Young Children: Comparison of Cross-Sectional and Prospective Clinical Data. <i>By JOEL A. GRINKER, STANLEY M. GARN, and KAREN R. ROSENBERG</i> .....	521
Which Subtype(s) of 5-HT Receptor Mediates the Anorectic Effects of Drugs That Act via the 5-HT System? <i>By G. HEWSON, G. E. LEIGHTON, R. G. HILL, and J. HUGHES</i> .....	525
Comparison of the Action of Macronutrients on the Expression of Appetite in Lean and Obese Human Subjects. <i>By ANDREW J. HILL and JOHN E. BLUNDELL</i> .....	529
Comorbidity of Eating Disorders in Comparison with Mood Disorders. <i>By WOLFGANG HILLER and MICHAEL ZAUDIG</i> .....	532
A Laboratory Study of Cognitive Factors in Bulimia: Abstinence Violation Effect. <i>By EMILY FOX KALES</i> .....	535
Weight Loss and Eating Behavior with a Gastric Balloon. <i>By THERESA A. SPIEGEL, F. MATTHEW KRAMER, and ALBERT J. STUNKARD</i> .....	538
Effect of Intravenous Branched Chain Amino Acids on Eating Behavior and Brain Biogenic Amine Levels of Rats. <i>By AKIO KUBOTA, MICHAEL M. MEGUID, ANTONIO C. CAMPOS, TING-YUAN CHEN, and DAVID HITCH</i> .....	541
Cognitive Processing in Bulimia Nervosa: Preliminary Observations. <i>By REINHOLD G. LAESSEL, SABINE BOSSERT, GERTI HANK, KURT HAHLWEG, and KARL M. PIRKE</i> .....	543
Anorexia Nervosa as an Auto-Addiction: Clinical and Basic Studies. <i>By MARY ANN MARAZZI and ELLIOTT D. LUBY</i> .....	545
Gustatory Perceptions and Preferences in Young Ballerinas. <i>By CHRISTINE MARTIN and FRANCE BELLISLE</i> .....	548
Effect of Intravenous Glucose Load on Food Intake and Brain Bioamine Levels. <i>By MICHAEL M. MEGUID, YOSHITO KAWASHIMA, and ANTONIO CARLOS L. CAMPOS</i> .....	550
Amelioration of Anorexia Induced by Food Restriction in Vasopressin-Deficient Rats by Altering Food Intake Schedules. <i>By HELEN M. MURPHY and CYRILLA H. WIDEMAN</i> .....	553

Perception of Hunger and Satiety Induced by 2-Deoxy-d-Glucose in Anorexia Nervosa, Bulimia Nervosa, and Obesity. <i>By YOSHIKATSU NAKAI, FUMIKO KINOSHITA, TOSHIKIYO KOH, SATORU TSUJI, TOSHIHIKO TSUKADA, SHIGEO NAKAISHI, JUNICHI FUKATA, and HIROO IMURA</i> .....	556
Sleep States and Body Temperatures in Patients with Anorexia Nervosa. <i>By MICHAEL M. NEWMAN, KATHERINE HALMI, EVELYN SATINOFF, JACK KATZ, and CHARLES POLLAK</i> .....	559
Behavioral Model of Anorexia Nervosa: Characteristics of Young Female Rats with Restricted Feeding in Activity-Wheel Cages. <i>By NOBUYA OGAWA, CHIAKI HARA, and KOUKI WATANABE</i> .....	561
Relationship between Taste and Food Preferences in Eating Disorders. <i>By BEVERLY PIERCE, K. A. HALMI, and SUZANNE SUNDAY</i> .....	564
Outcome and Prognostic Factors after 20 Years of Anorexia Nervosa. <i>By R. H. RATNASURIYA, I. EISLER, G. SZMUKLER, and G. F. M. RUSSELL</i> .....	567
Uncoupling Sweet Taste and Calories: Effects of Saccharin on Hunger and Food Intake in Human Subjects. <i>By PETER J. ROGERS and JOHN E. BLUNDELL</i> .....	569
Modulation of Nocturnal Free Feeding by Drugs Acting on Serotonergic Neuronal Processes in Rats. <i>By KENNY J. SIMANSKY</i> .....	572
Cognitive Sets toward Foods: Eating Disorders versus Restrained and Unrestrained Eaters. <i>By SUZANNE R. SUNDAY, KATHERINE A. HALMI, and BEVERLY D. PIERCE</i> .....	575
Failure of Pizotifen (BC-105) to Stimulate Appetite in Rats. <i>By ARTUR H. SWIERGIEL and GEORGES PETERS</i> .....	578
Behavioral and Biological Correlates of Restrained Eating. <i>By REINHARD J. TUSCHL, REINHOLD G. LAESSLE, BRITTA C. KOTTHAUS, and KARL MARTIN PIRKE</i> .....	580
Insulin, Sham Feeding, Real Feeding, Glucostasis, and Flavor Preferences in the Rat. <i>By DENNIS A. VANDERWEELE and RHONDA OETTING DEEMS</i> .....	582
Cognitive and Physiological Effects on Hunger and Food Intake. <i>By JANE WARDLE and JANE OGDEN</i> .....	585
Eating Restraint, Presentation Order, and Time of Day Are Related to Sweet Taste Preferences. <i>By ZOE S. WARWICK, PHILIP R. COSTANZO, JAMES M. GILL, and SUSAN S. SCHIFFMAN</i> .....	588
Doses of Cholecystokinin and Glucagon That Combine to Inhibit Feeding Do Not Affect Gastric Emptying in the Rat. <i>By SALLY C. WEATHERFORD and SUE RITTER</i> .....	592
Feeding-Associated Alterations in Striatal Neurotransmitter Release. <i>By IAN N. ACKWORTH, KERRY RESSLAR, and RICHARD J. WURTMAN</i> .....	596
Estrogen-Induced Food Aversion in the Rat: Relevance to Anorexia Nervosa. <i>By JOHN K. YOUNG, CARL R. GUSTAVSON, and JOAN C. GUSTAVSON</i> .....	599
Effects on Feeding Responses of the Selective Dopamine D-1 Antagonist SCH 23390 and the Selective D-2 Antagonist YM 09151-2 in the Rat. <i>By PETER G. CLIFTON, ILENE N. RUSK, and STEVEN J. COOPER</i> .....	602

Central and Peripheral 5-HT Receptors Mediate Reductions in Sucrose Sham Feeding in the Rat. <i>By STEVEN J. COOPER and JOANNA C. NEILL</i> .....	606
$\beta$ -Endorphin and Activity-Based Anorexia in the Rat: Influence of Simultaneously Initiated Dieting and Exercise on Weight Loss and $\beta$ -Endorphin. <i>By LEE E. DOERRIES, PAUL F. ARAVICH, ARTHUR METCALF, JAMES D. WALL, and THOMAS J. LAUTERIO</i> .....	609
A Residential Laboratory for the Study of Human Eating Behavior. <i>By RICHARD W. FOLTIN, MARIA W. FISCHMAN, and THOMAS H. KELLY</i> .....	611
Hypothalamic $\alpha_2$ -Noradrenergic Receptor System: Relation to Dietary, Genetic, and Hormonally Induced Obesity. <i>By M. JHANWAR-UNIYAL, J. A. GRINKER, J. A. FINKELSTEIN, W. BLOCK, and S. F. LEIBOWITZ</i> .....	613
Ingestion of Highly Palatable Sucrose Induces Naloxone Supersensitivity in the Sham-Feeding Rat. <i>By T. C. KIRKHAM and S. J. COOPER</i> .....	616
Impact of Hypothalamic Serotonin on Macronutrient Intake. <i>By N. ROGACKI, G. F. WEISS, A. FUEG, J. S. SUH, S. PAL, B. G. STANLEY, D. T. WONG, and S. F. LEIBOWITZ</i> .....	619
Developmental Patterns of Eating Behavior. <i>By G. SHOR-POSNER, G. BRENNAN, R. JASAITIS, C. IAN, B. LEIBOWITZ, and S. F. LEIBOWITZ</i> .....	622
Index of Contributors .....	625

**Financial assistance was received from:**

- THE COCA COLA COMPANY
- HOFFMANN-LA ROCHE, INC.
- INSTITUT DE RECHERCHES INTERNATIONALES SERVIER
- KRAFT, INC.
- LILLY RESEARCH LABORATORIES
- M&M/MARS
- MONSANTO COMPANY
- THE NUTRASWEET COMPANY
- PARKE-DAVIS PHARMACEUTICAL RESEARCH DIVISION  
WARNER-LAMBERT COMPANY
- PEPSICO INC., RESEARCH & TECHNICAL SERVICES
- PFIZER CENTRAL RESEARCH
- SOCIETY FOR THE STUDY OF INGESTIVE BEHAVIOR
- THE SUGAR ASSOCIATION, INC.
- THOMPSON MEDICAL

The New York Academy of Sciences believes that it has a responsibility to provide an open forum for discussion of scientific questions. The positions taken by the participants in the reported conferences are their own and not necessarily those of the Academy. The Academy has no intent to influence legislation by providing such forums.

